INTEX-NA Flight 7: July 12, 2004

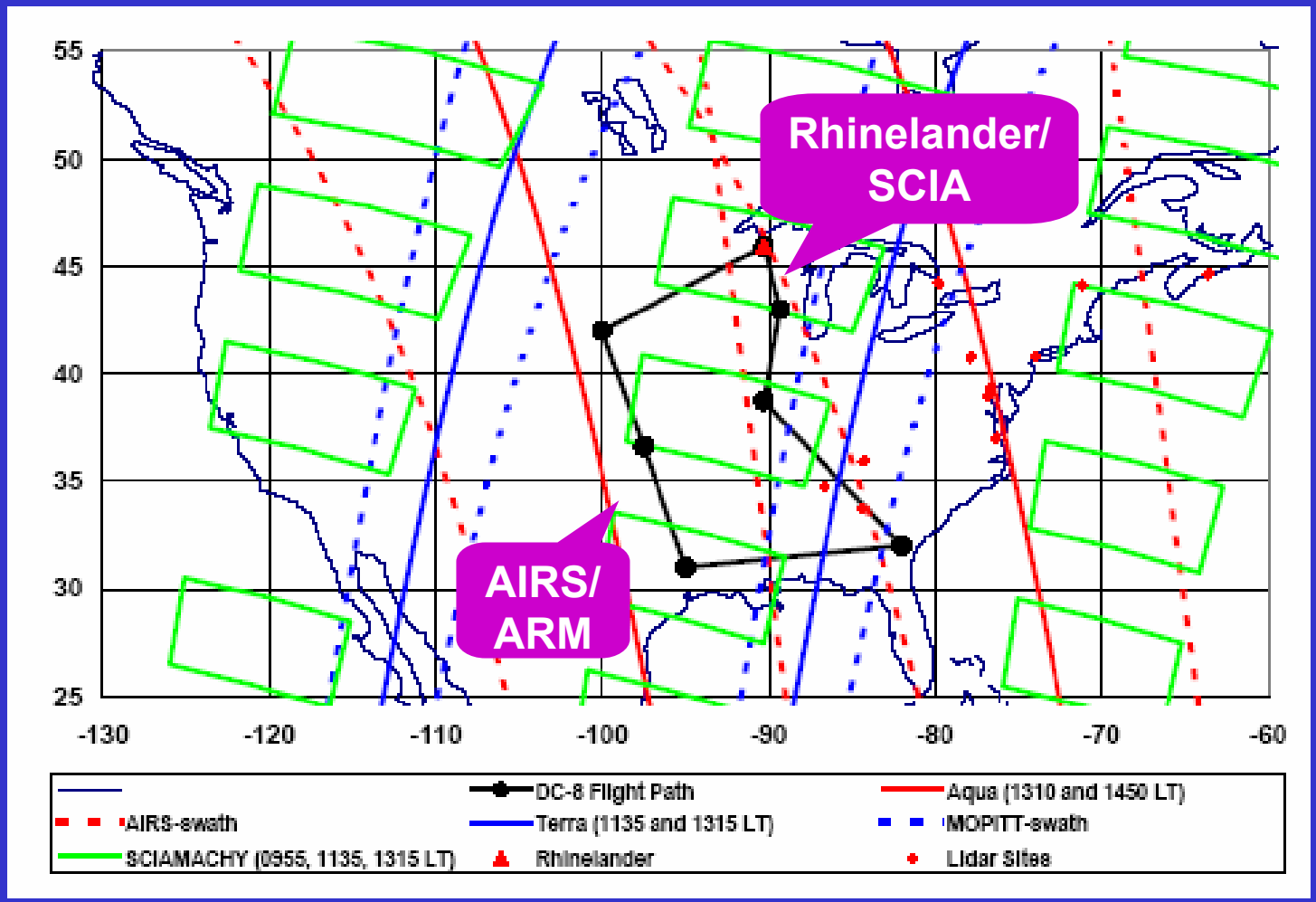
This flight had three objectives: (1) mapping of boundary layer composition across the central U.S., (2) observation of aged convective outflow over the southeast U.S., (3) validation of Park Falls FTS, SCIAMACHY, and AIRS. This was a 9 h0ur flight with a nominal 10 am take off time.

There was little frontal activity over the flight area. A very diffuse stationary front stretched from the Middle Atlantic Coast to Nebraska. A relatively strong cold front was approaching the flight area extending north to south from North Dakota to western Nebraska. Weak high pressure dominated much of the area. At higher levels strong high pressure was located over the northern Gulf of Mexico, extending to a ridge over the Rocky Mountains. This produced offshore flow over the eastern Gulf States, and onshore flow over the western Gulf. Since the winds were light, convective outflow from the previous days did not travel far, and mostly was concentrated along the southeastern United States. At higher latitudes, a short wave trough was located over the Atlantic Coast, while a weak short wave was over the western Great Lakes. Deep convection along the flight track was less widespread than during the previous flight. Most of the storms were located along the Appalachians, extending into the northern portions of Georgia and Mississippi.

The flight began with a 25-min northward leg at 20K where we sampled continental background. We then climbed to 33000 ft towards our Park Falls spiral point (46N, 90W) and sampled some fresh convective outflow, apparently from thunderstorms over North Dakota the previous evening. The spiral over Park Falls was initialized at 1120 local and was conducted under scattered cloud conditions. The boundary layer top was at 7000 ft. We then headed SW to a waypoint at (42N,100W) and then SE at (37N,98W). This part of the flight consisted of a series of 20-min boundary layer legs (1000 ft) with short 15000 ft legs in between. The boundary layer legs sampled successively a forest/lake environment over Wisconsin, farmland over southern Minnesota, and dry rangeland over central Nebraska. In all cases the skies were clear and boundary layer tops were relatively shallow, about 5-6000 ft. The leg over Minnesota had CO_2 concentrations of 351 ppmv, the lowest observed so far in the mission. In contrast, very high CO_2 concentrations were observed in the boundary layer over Nebraska (393 ppmv). Concentrations of CO and ozone increased as the plane headed southward but never registered high values. Some very high boundary layer dust concentrations were observed over Nebraska and southward, mostly in the boundary layer. At the end of the Nebraska leg the aircraft climbed up to 33K over northern Kansas, getting into a tropical air mass (CO less than 70 ppbv, ozone less than 30 ppbv) and then hitting a sharp chemical gradient during the 33K leg at (38N,99W) with aged convective outflow to the south characterized by relatively high CO (99 ppbv), high ozone (76 ppbv), and high refractory aerosol. We then conducted an AIRS validation spiral at (36N,97W) under clear skies. As we went down below 30K we got out of the aged convection layer and briefly into the tropical layer before entering continental background air. The BL top was at about 4K. There were several small agricultural fires that we deliberately avoided for the purpose of the spiral. The rest of the flight consisted of deep vertical profiles from 1K to aircraft ceiling (37-39K) on an E track to (32N,83W) and then a NW track back to Midamerica, with the objective of characterizing the aged convective outflow. This outflow was consistently observed above 24K and featured extremely high ozone (up to 106 ppbv) though with only moderately high CO (~100 ppbv).

The navigational data are available at URL: http://www.dfrc.nasa.gov/Research/AirSci/DC-8/ICATS/index.html

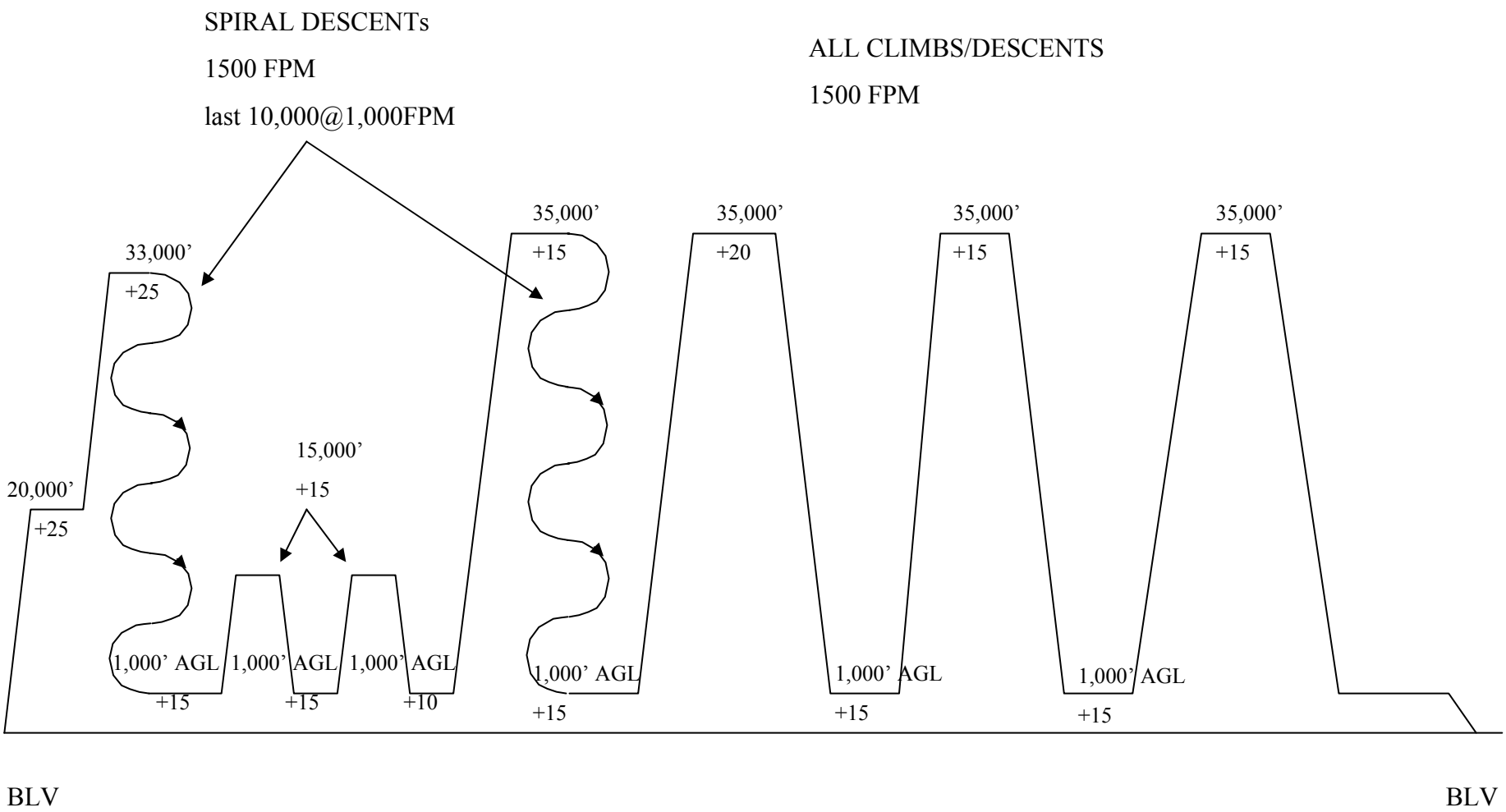
INTEX-7 flight plan July 12, 2004



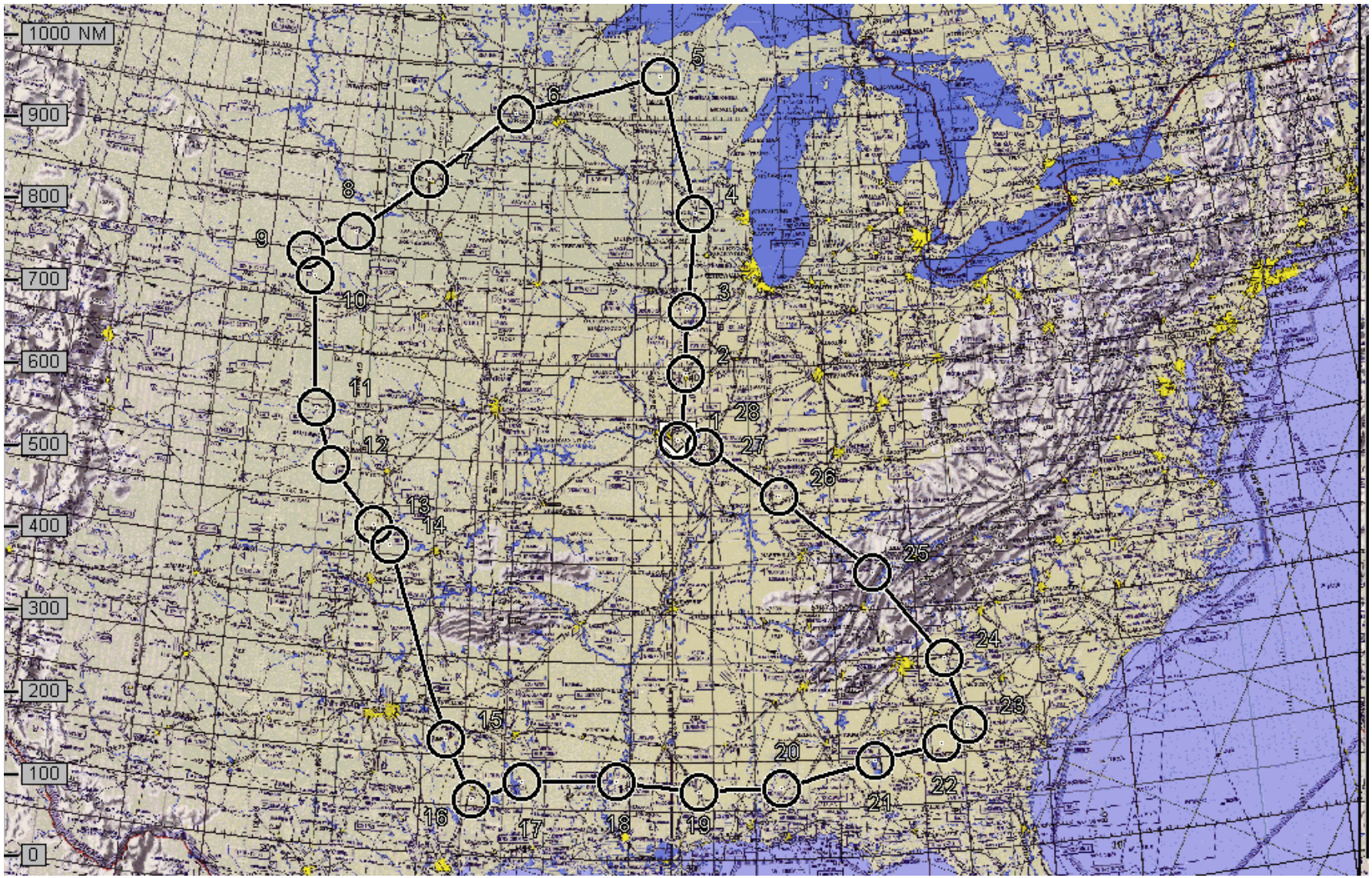
Objectives:

1. Boundary layer mapping of south-central U.S. (natural gas/pollution?)
2. Aged convective/lightning outflow over southeast U.S.
3. Validation of CO_2 column/Rhinelander, SCIAMACHY, AIRS

INTEX July 12 NASA 817



INTEX July 12 NASA 817



TYPE ACFT	CALL SIGN	DATE	FROM	TO	PLND TO	ACT TO	PILOT	COPILOT
DC-8	NASA817		SCOTT AFB MID N 38 32.7 W089 50.1	SCOTT AFB MID N 38 32.7 W089 50.1	10:11			

TOT DIST	TOT TIME	FUEL REQ	NAVIGATOR	ENGINEER
2792.9	09+14	95170		

TP DTD#	Fix/Point Description	FREQ	Latitude Longitude	Alt Wind	TAS GS	TC MC	LEG DIST DIST REM	LEG TIME TIME REM	ETA	RETA	ATA	REMARKS
1	KBLV/A SCOTT AFB MID		N 38 32.7 W089 50.1	459M		136 137	5.0 2788	00+02 09+12	10:11			
2	CAP/R CAPITAL	074X 112.70	N 39 53.5 W089 37.5	20000M	400 400	004 005	84.6 2703	00+14 08+58	10:27			
3	BDF/R BRADFORD	094X 114.70	N 41 09.6 W089 35.3	20000M	400 400	001 002	76.0 2627	00+11 08+46	10:38			
4	MSN/R MADISON	023X 108.60	N 43 08.7 W089 20.4	20000M	420 420	005 007	119.6 2508	00+17 08+29	10:55			
5	.PT 05 IWD/R192038	025X 108.80	N 45 55.0 W090 20.0	20000M	420 420	346 347	171.7 2336	00+25 08+05	11:20			SPIRAL DOWN
	.delay	025X 108.80	N 45 55.0 W090 20.0	20000M	330 330	346 347	0.0 2336	00+30 07+35	11:50			
6	DWN/R DARWIN	027X 109.00	N 45 05.2 W094 27.2	20000M	330 330	254 253	180.8 2155	00+33 07+02	12:23			
7	FSD/R SIOUX FALLS	097X 115.00	N 43 39.0 W096 46.9	20000M	330 330	229 226	132.2 2023	00+24 06+38	12:47			
8	ONL/R O'NEILL	086X 113.90	N 42 28.2 W098 41.2	20000M	330 330	230 224	109.7 1913	00+20 06+18	13:07			
9	CUZ/E328034	019X 108.20	N 42 00.0 W100 00.0	20000M	330 330	244 238	65.0 1848	00+12 06+06	13:19			
10	CUZ/E CUSTER COUNTY	019X 108.20	N 41 29.0 W099 41.3	20000M	330 330	156 149	34.0 1814	00+06 06+00	13:25			
11	HYS/R HAYS	041X 110.40	N 38 50.9 W099 16.6	20000M	330 330	173 167	159.2 1655	00+29 05+31	13:54			
12	PTT/N PRATT	356.00	N 37 43.4 W098 44.8	20000M	330 330	160 153	71.9 1583	00+13 05+18	14:07			
13	.CART SITE PER/R236019	079X 113.20	N 36 36.0 W097 30.0	20000M	330 330	138 133	90.1 1493	00+16 05+01	14:23			SPIRAL DOWN DRIFT EAST

TP	Fix/Point	FREQ	Latitude	Alt	TAS	TC	LEG DIST	LEG TIME	ETA	RETA	ATA	REMARKS

DTD#	Description		Longitude	Wind	GS	MC	DIST REM	TIME REM				
	.delay	079X 113.20	N 36 36.0 W097 30.0	20000M	330 330	138 133	0.0 1493	00+30 04+31	14:53			
14	SWO/E STILLWATER	021X 108.40	N 36 13.5 W097 04.9	20000M	330 330	138 133	30.3 1463	00+06 04+26	14:59			FINISH SPIRAL BELOW 18,000
15	TYR/E TYLER	089X 114.20	N 32 21.4 W095 24.2	20000M	330 330	160 156	246.2 1217	00+45 03+41	15:44			
16	LFK/R LUFKIN	058X 112.10	N 31 09.7 W094 43.0	20000M	330 330	154 150	79.6 1137	00+14 03+27	15:58			
17	MMY/N MANY	 272.00	N 31 34.3 W093 32.5	20000M	330 330	068 065	65.2 1072	00+12 03+15	16:10			
18	HEZ/E NATCHEZ	037X 110.00	N 31 37.1 W091 18.0	20000M	330 330	089 086	114.9 957	00+21 02+54	16:31			
19	LBY/R EATON	043X 110.60	N 31 25.1 W089 20.3	20000M	330 330	097 096	101.3 856	00+18 02+36	16:49			
20	MVC/R MONROEVILLE	115X 116.80	N 31 27.6 W087 21.2	20000M	330 330	089 089	101.9 754	00+19 02+17	17:08			
21	EUF/R EUFAULA	029X 109.20	N 31 57.0 W085 07.8	20000M	330 330	076 078	117.5 636	00+21 01+56	17:29			
22	VNA/R VIENNA	112X 116.50	N 32 12.8 W083 29.8	20000M	330 330	079 083	84.7 552	00+15 01+40	17:44			
23	DBN/R DUBLIN	078X 113.10	N 32 33.6 W082 50.0	20000M	330 330	058 063	39.6 512	00+07 01+33	17:52			
24	AHN/R ATHENS	033X 109.60	N 33 56.9 W083 19.5	20000M	330 330	343 348	86.7 425	00+16 01+17	18:07			
25	HCH/R HINCH MOUNTAI	123X 117.60	N 35 46.9 W084 58.7	20000M	330 330	323 328	136.8 288	00+25 +52	18:32			
26	CCT/R CENTRAL CITY	035X 109.80	N 37 22.9 W087 15.8	20000M	330 330	311 314	146.3 142	00+27 +26	18:59			
27	ENL/R CENTRALIA	097X 115.00	N 38 25.2 W089 09.5	20000M	330 330	305 306	109.4 33	00+20 +06	19:19			
28	KBLV/A SCOTT AFB MID		N 38 32.7 W089 50.1	20000M	330 330	283 284	32.7 0	00+06 +00	19:25			